Operating Instructions

ROTOFIX 32

Please enter the following details ::	
Stock no.	.....
Monitoring no.	.....
Location	.....

This operating instruction has to be used for the centrifuges bearing the following manufactoring Nos.:
(the Manufacturing No. of a centrifuge can be see from it name plate)

Type of centrifuge	Voltage	Article No.	Manufactoring No.
ROTOFIX 32	208-240 V	1205	XXXX-01-00
ROTOFIX 32	100-127 V	1205-01	XXXX

© 09.02 A. Hettich, D-78532 Tuttlingen Order No. AB087GB

Hettich
ZENTRIFUGEN

CE

Certificate of EU - Conformity

as defined by the EU regulations

- for machines 89/392/EWG
- for electro-magnetic compatibility 89/336/EWG, amended by regulations 91/263/EWG, 92/31/EWG and 93/68/EWG
- for low voltage 73/23/EWG, amended by regulation 93/68/EWG

We, Messrs. Andreas Hettich
Gartenstraße 100
D-78532 Tuttlingen,

hereby certify that centrifuge model(s)

ROTOFIX 32

is (are) manufactured in accordance with the following standards and regulations:

EN 61010 part 1 and 2
EN 55011

in addition the following national standards and regulations are applied:

VBG 1	DIN 58970
VBG 4	BS 4402
VBG 7z	
VBG 20	

Tuttlingen 12.06.2003 Hettich Zentrifugen

ppa. H. Eberle

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1 Intended application

The centrifuge is used for separating substances or mixtures with a density of up to max. 1.2 kg/dm³.
Through the production of centrifugal force it can separate mixtures or alter the proportions in a mixture.
If the substance or mixture to be centrifuged is denser than 1.2 kg/dm³, the rated speed should be reduced (see section “Centrifuging of denser substances”).

2 Notes on safety

- This centrifuge is a state-of-the-art piece of equipment which is extremely safe to operate.
  - However, it can lead to danger for users or others if used by untrained staff, in an inappropriate way or for a purpose other than that it was designed for.
- Before the initial operation of your centrifuge you should read and pay attention to the operating instructions.
- Along with the operating instructions and the legal regulations on accident prevention, you should also follow the recognised professional regulations for working in a safe and professional manner.
  These operating instructions should be read in conjunction with any other instructions concerning accident prevention and environmental protection based on the national regulations of the country where the device is to be used.
- The centrifuge should be installed on a good, stable base.
- When setting the equipment up you should pay attention to the following points:
  - A 300 mm safety zone must be established around the centrifuge in accordance with IEC 1010-2-2.
  - This safety zone must be kept clear of both people and hazardous substances at all times when the centrifuge is in operation.
  - According to the laboratory instrument standards EN 61010-2-20 an emergency switch to separate power supply in the event of a failure must be installed in the building electrical system.
    This switch has to be placed remote from the centrifuge, prefered outside of the room in which the centrifuge is installed or near by the exit of this room.
- Do not place any object in front of the ventiduct.
  - Keep a ventilation area of 300 mm around the ventiduct.
- The centrifuge should always be loaded evenly.
- Centrifuge containers must not be filled beyond the capacity specified by the manufacturer.
  - Centrifuge containers should only be filled outside the centrifuge.
- Standard centrifuge containers of glass will not stand RCF values exceeding 4000 (DIN 58970, pg. 2)
- No attachments should be used other than those authorised by the manufacturer.
- Centrifuge containers may only be centrifuged with accessories (reducing adapters, frames, suspensions, etc.) authorised by the manufacturer (see section "Rotors and accessories).
- The centrifuge may only be operated when the balance is within the bounds of acceptability.

- The centrifuge must not be operated in areas subject to danger of explosions.
- The centrifuge must not be used with:
  - inflammable or explosive materials
  - materials that react with one another producing a lot of energy.
- If users have to centrifuge hazardous materials or compounds contaminated with toxic, radioactive or pathogenic micro-organisms, they must take appropriate measures. Without additional proceedings (like an additional bioseal between bucket and lid of bucket or angle rotor with a special bioseal between rotor and lid) a centrifuge is not a biosafety system in accordance to the regulation EN 61010-2-20. In the case of material belonging to risk group II (see the World Health Organisation's "Laboratory Biosafety Manual") they should employ a biosafety system. Under this system small drips and aerosols are prevented from escaping by a bioseal (packing ring) located between the hanger and the lid. Centrifuge containers with special screw caps, as obtainable through trade suppliers, can also be used for hazardous substances.
  In the case of materials from the higher risk groups greater safety provision is required than the arrangements described above. In a biosafety system, centrifuge containers with special screw caps must be used.
- For further details of available biosafety systems see section "Rotors and accessories". If in doubt, you should obtain relevant information from the manufacturer.
- The centrifuge must not be operated with highly corrosive substances which could impair the mechanical integrity of rotors, hangers and accessories.
- Any rotors, hangers or accessories showing clear signs of corrosion or mechanical defects must not be used for centrifuging.
- In order to prevent corrosion developing through cleaning or disinfectant agents, it is most important that any specific instructions from the manufacturers of such agents should be followed carefully.
  Before applying any cleaning or disinfecting procedure other than those recommended by the manufacturer, the user should contact the manufacturer to make sure that the planned process will not damage the equipment.
- Only original spare parts and authorised original accessories may be used.
- In case of fault or emergency release, never touch the rotor before it has stopped turning.
- This centrifuge is classified in Germany as a Group 3 device according to the *Medizinische Geräteverordnung MedGV* (the regulations on medical equipment).
- It conforms to safety regulations based on:
  IEC 1010-1/-2
  DIN - EN61010 Parts 1and 2
- The safe operation and reliability of the centrifuge can only be guaranteed if:
  - the centrifuge is operated in accordance with the operating instructions,
  - repairs are carried out by engineers approved by the manufacturer,
  - the electrical installation on the site where the centrifuge is installed conforms to the demands of IEC stipulations,
  - prescribed tests to UVV-VBG7z are carried out by an expert.
- With centrifuges for robotic use please pay attention to the notes of the key operated switch.

No claim under guarantee will be considered by the manufacturer unless the above instructions have been adhered to.

3 Warning symbols

Caution! Follow instructions carefully.

Load centrifuge rotor evenly.
All positions on rotor must be filled.

Do not fill centrifuge containers inside the centrifuge.

4 Delivery checklist

The following items and accessories are delivered with the centrifuge:

1	Connecting cable	
	- Model 1205	
	- Model 1205-01	
2	Fuse	
	- Model 1205	T3.15 AH
	- Model 1205-01	T5.0 AH
1	Hex. pin driver	
1	Release pin	
1	Notes on moving the equipment safely	
1	Operating instructions	
1	Rotor instructions	
1	Lubricating grease for supporting lugs	

The rotor(s) and associated accessories are included in the delivery in the quantity

5 Manufacturer's address

Hettich Zentrifugen GmbH & Co. KG
Gartenstraße 100
D-78532 Tuttlingen
Germany
Telephone ## 49 7461 705-0, Fax ## 49 7461 705-125
e-mail Info@HettichLab.com
http:\\www.HettichLab.com

6 Technical datas

Manufacturer	Hettich Zentrifugen D-78532 Tuttlingen	
Model	ROTOFIX 32	
Product No. Mains voltage (± 10%) Mains frequency Connected load Current consumption Power consumption	1205 208 - 240 V 1~ 50 - 60 Hz 300 VA 1.3 A 160 W	1205-01 100 - 127 V 1 ~ 50 - 60 Hz 250 VA 2.4 A 165 W
Max. capacity Max. density Speed RPM Force RCF Kinetic energy Obligatory inspection	4 x 100 ml 1.2 kg/dm^3 6000 4186 3000 Nm no	
Environment – Ambient temperature – Relative humidity	5°C up to 40°C max. 80% to 31°C, descending in a linear pattern down to 50% at 40°C	
Sample overtemp.	≤ 15 K	
Class of protection	I	
EMC – Emission (Radio interference suppression) – Immunity	ISM (Industrial Science Medicine) EN 55011 Class B according to EN 50082-1	FCC Class B
Noise level (dependent on rotor)	≤ 65 dB(A)	
Dimensions • Width • Depth • Height	 368 mm 437 mm 261 mm	
Weight approx.	15.6 kg	

7 Space requirement

- According to the laboratory instrument standards EN 61010-2-20 an emergency switch to separate power supply in the event of a failure must be installed in the building electrical system.
  This switch has to be placed remote from the centrifuge, prefered outside of the room in which the centrifuge is installed or near by the exit of this room.
- The necessary space requirement can be found under Dimensions in the Technical data chapter.
- The centrifuge must be set up in a suitable place, so that it is stable. During set up the required safety area of 300 mm around the centrifuge, in accordance with IEC 1010-2-2, must be observed.

Persons and hazardous materials must not be located in the safety area whilst the centrifuge is in operation.

- Do not place any object in front of the ventiduct.
  – Keep a ventilation area of 300 mm around the ventiduct.

8 Connection to the mains

- Check whether the supply voltage, supply frequency and on-site mains fuse agree with the specification on the nameplate. The nameplate is located on the back of the centrifuge.
- Make sure that the mains switch is in the “0” position.
- The centrifuge must be connected to a standard mains socket using the power supply cable provided.

9 Commissioning

- Check that the centrifuge has been properly set up and that the electrical connections are correct (see Connection to the Mains and Space Requirement).
- Switch the mains switch “ON”, switch position “I”.
  After a short time the control panel will switch on and the last set parameters will appear in the displays.
- When the symbol has lit up, the lid can be opened.
- Open the lid and remove the transport protection (see Transport Protection information sheet).

10 Opening the lid

- When the symbol has lit up, the lid can be unlocked and opened.
- Unlock the lid by turning the swivel clamp upwards.
- The symbol appears.
- Open the lid.

The lid can only be opened if the centrifuge is switched on and the rotor is stationary.
If this is not possible, see chapter “ Emergency release “.

11 Fitting / arming the rotor

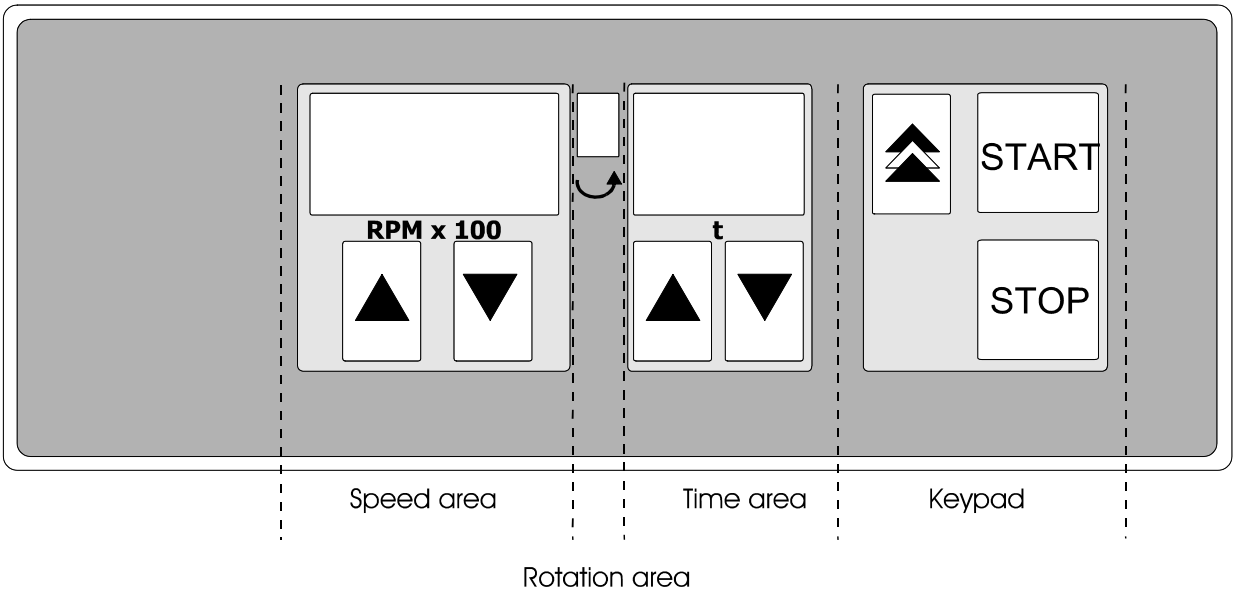
- To fit the rotor, please see the B32 Rotor Instructions provided, or the section " Changing the rotor ".
- In the case of rotors with swinging suspension fittings, all rotor positions must be occupied.
  Empty rotor positions are not permissible.
- Always fill the centrifuge containers outside the centrifuge.
- Ensure, by eye, that the containers are filled to a uniform level.
- Load positions located opposite one another equally.
  For permitted combinations, see the "Rotors and Accessories" chapter in the appendix.
- Ensure that the rotor is correctly positioned and secured.
- Close the lid by turning the handle downwards. When the symbol lights up in the rotation display, the lid is correctly locked.

At each start, the rotor code of the rotor used is read in.
At each rotor change, the centrifuge stops after a few rotations and the rotor code is shown in the display again. Centrifuging can be continued by repeatedly pressing the START key (see Rotor Recognition chapter).

12 Control panel

The control panel is divided into four areas.

- Speed
- Rotation display
- Time
- Keys



12.1 Speed area

The speed area contains the speed display which indicates the preselected speed or the ACTUAL speed during operation.
The speed can be preselected or changed during operation with the ▲ and ▼ arrow keys. At the end of operation, the display flashes in seconds until the lid is opened or a key is activated.

12.2 Rotation area

The rotation area contains the rotation display, which illuminates and rotates anti-clockwise whilst the rotor is turning.
When the symbols lights up, the rotor is stationary and the lid can be opened.
When the lid is unlocked, the symbol lights up.

12.3 Time area

This area contains the running time display and the ▲ and ▼ arrows, with which the switch-on time can be preselected or changed during operation.
When stationary, the preselected switch-on time is displayed, as well as the remaining run time during operation. The decimal point flashes each second during operation.
At the end of operation, the display flashes each second until the lid is opened or a key is activated.

12.4 Key area

Start key START	To start a run with the preselected parameters.
Stop key STOP	The STOP key allows a centrifuging run to be stopped at any time.
Pulse key	Brief centrifuging whilst the key is pressed down. The run time is displayed in seconds in the run time display. After 60 seconds, the run time is displayed in minutes.

13 Adjustable parameters

Speed	• min. speed 500 rpm • max. speed 6000 rpm • in steps of 100 rpm Adjustable up to max. speed of the rotor used.
Time "—" or	• min. preset time 1 min • max. preset time 99 min • in steps of 1 min or • continuous operation or • pulse (short-time)
Braking force	• full braking effect • low braking effect

14 Preselecting centrifuging parameters or changing them during operation.

14.1 Speed

Each time the ▲ and ▼ arrow keys are activated, the speed is changed by 100 rpm. If an arrow key is kept pressed down for longer, the speed is changed at an increasing rate.
If the speed is changed during operation, this becomes effective immediately, i.e. the speed is adjusted.

14.2 - of denser substances

The rotors are designed to centrifuge substances up to a maximum mean homogenous density of 1.2 kg/dm^3 when rotating at the stated speed.
Denser substances must be centrifuged at lower speed.

The permissible speed can be calculated using the following formula:

$$\text{Reduced speed } (n_{red}) = \sqrt{\frac{1.2}{\text{Greater density}}} \text{ x Rated speed}$$

e.g.: RPM 4000, density 1.6 kg/dm^3

$$n_{red} = \sqrt{\frac{1.2}{1.6}} \text{ x } 4000 = 3464 \text{ RPM}$$

If in doubt you should obtain clarification from the manufacturer.

14.3 Run time

Each time the ▲ and ▼ arrow keys are activated, the run time is changed by 1 minute.
If an arrow key is kept pressed down for longer, the run time is changed in minute steps, at an increasing rate.
If the run time is changed during operation, this becomes effective immediately, i.e. the remaining run time is adjusted.

> ⚠ If an arrow key is activated during operation, the run time or speed is adjusted accordingly.

14.3.1 Continuous operation

The centrifuge can be operated in continuous operation. Continuous operation is set by pressing the ▼ arrow key until " – " appears in the run time display. Operation is only stopped by activating the ○ STOP key.

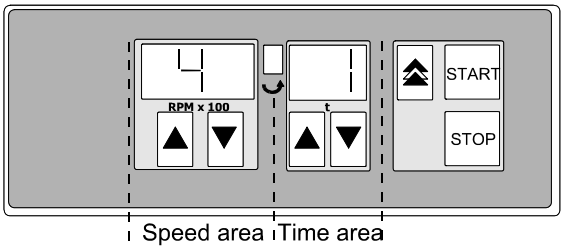
14.3.2 Pulsed operation

For brief centrifuging. The rotor turns at the preselected speed as long as the ⏫ key is pressed down.

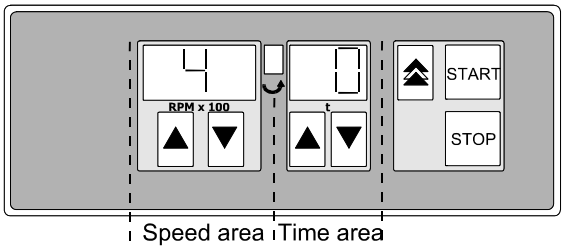
14.4 Brake adjustment

With this centrifuge, the braking effect can be set to normal or low.
This can be set before a run, as follows:

1. Switch off the mains switch
2. Simultaneously press the pulse key ⏫ and the arrow key ▲ in the speed area and switch on the mains switch. Release the keys again.
3. If required press the arrow button ▲ in the speed field until the depicted display appears.
   In the speed field the machine version as set by the factory and in the time field the brake setting.



Normal braking effect “1”



Low braking effect “0”

4. Set the required value, “1” or “0”, in the time area with the ▲ and ▼ arrow keys.
5. Confirm the set value with the STOP key.
   See Rotors and Accessories in the Braking Times chapter.

14.5 Start centrifuging run

After setting the centrifuging parameters, start the centrifuge by pressing the START key.

14.6 End centrifuging run

A centrifuging run is ended by pressing the STOP key or after expiry of the set run time.

15 Calculating rotational speed RPM and relative centrifugal force RCF

These values are calculated using the formulas below:

$$RCF = \left(\frac{RPM}{1000}\right)^2 \times r \times 1.118 \qquad RPM = \sqrt{\frac{RCF}{r \times 1.118}} \times 1000$$

RCF = Relative centrifugal force
RPM = Rotational speed (revolutions per minute)
r = Radius in mm = Distance from the centre of the axle to the floor of the centrifuge container. For further details on radius see “Rotor and accessories” section.

16 Changing the rotor

- Open the lid.
- Loosen the rotor tensioning nut by turning it counter-clockwise with the appropriate spanner (see delivery checklist) until the release point is reached. Once this point is passed, the rotor frees itself from the motor-shaft cone. Continue turning the nut until the rotor can be lifted off the motor shaft.
- Clean the motor shaft and then lightly grease.
- Place the new rotor vertically on the motor shaft. The motor-shaft carrier pin must be located in the groove on the rotor.
- Tighten the tensioning nut.
- Check that the rotor is seated securely.

17 Rotor identification

- Each time a centrifuging run is started, the centrifuge recognises the rotor code of the installed rotor with the help of a sensor. This means that the nominal speed of the installed rotor cannot be exceeded.
- After the identification of a newly installed rotor the drive will cut off and its rotor code "rot ..." will be displayed. Example: rot 3 = rotor code 3.
- Press the START key.
- If the speed rating of the newly installed rotor is lower than the last speed entered, the speed rating of the newly installed rotor will be displayed.
  If the speed rating of the newly installed rotor is higher than the last speed entered, the last speed entered will be displayed.
- Press the START key.
- Any speed up to the rated speed of the rotor can be entered while the centrifuge is running.
  If no rotor is fitted and the centrifuge is started, the centrifuge stops after a few rotations and the error message – F – appears in the display
  (to reset the error message, see Fault Table).

18 Emergency release

If loss of current or a centrifuge fault occurs while the centrifuge is running, the lid remains locked.

To release in an emergency, unplug the centrifuge from the mains.
Wait for the rotor to stop turning before opening the lid.

Insert the release pin (see scope of supply) horizontally into the hole located at the top right of the front panel. Push the release pin as far as the stop. Push the tip of the pin down, at the same time swielling the hand grip upwards. Open the lid.

19 Care / maintenance

> ⚠ Before applying any cleaning or disinfecting procedure other than those recommended by the manufacturer, the user should contact the manufacturer to make sure that the planned process will not damage the equipment.

- The centrifuge should be cleaned regularly for reasons of hygiene, and if necessary should also be cleaned with soap or a mild cleaning agent.
- Any adherent impurities should be removed as they can cause corrosion.
- Humidity in the air or centrifuge containers with no hermetic seal can lead to condensation. The centrifuge chamber should therefore be cleaned regularly with a cloth or similar.
- For instructions on how to clean the rotor and accessories see the rotor instructions B032.
- In the case of glass breakage, the fragments of glass along with any spilt centrifuge product should be removed carefully from the centrifuge chamber, the containers or container drill holes.

> ⚠ After a glass breakage the rubber inserts for the containers must be replaced because any residual glass fragments in these inserts can cause further glass breakage.

- If any infectious material should find its way into the centrifuge chamber it should be disinfected immediately.
- When a biosafety system is in use (see section “Rotors and accessories”), the bioseal (packing ring) between the hangers and the lid must be checked and cleaned regularly. This routine should be performed at least once a week.
  The packing ring should be replaced as soon as any signs of tears, brittleness or wear are shown.

19.1 Supporting lugs

The supporting lugs on the rotor must always be well lubricated (use Hettich lubricating grease no. 4051). Only when the supporting lugs are lubricated can it be guaranteed that the hangers will swing out evenly and that the centrifuge will not cut out during operation.

20 Faults

20.1 Note on faults

- If any fault or defect should arise, this is indicated by a symbol on the screen.
- The drive cuts out. Depending on the error message the run-down is either with or without braking. After the rotor has come to rest, clearance for opening the lid is issued.

  MAINS RESET: - Mains switch OFF for longer than 10 secs.
  - Mains switch ON.

If the fault cannot be rectifield by following the troubleshooting guide and if the error message reappears after performing a MAINS RESET, you should contact Customer Services.

20.2 Fault table

Fault	Display	Cause of fault	Remedy
No display	---	No voltage Triggering of the excess current cut-out.	• Check distribution voltage. • Check fuses. • Mains switch ON
Tacho error	- 1 -	Failure of speed impulses during operation, Unbraked runout.	• Wait 120 sec. delay time. • Perform mains reset.
System reset	- 2 -	Failure of power supply during a run Unbraked runout.	• When stationary, open lid and press START key.
Balance error	- 3 -	Balance error on the motor axis due to weight differences in the rotor loading.	• Open lid when rotor is stationary. • Eliminate balance error.
Communication	- 4 -	Fault in control unit or power unit. Unbraked runout.	• Perform mains reset when stationary.
Overload	- 5 -	Motor or motor control defective.	• Perform mains reset when stationary.
Overvoltage Undervoltage	- 6 - - 8 -	Supply voltage outside tolerance (see Technical Data) Unbraked runout.	• Perform mains reset when stationary. • Check supply voltage.
Overspeed	- 7 -	Fault in the supply board Unbraked runout	• Perform mains reset when stationary
Excess temperature	- 9 -	Excess temperature switch in motor has triggered. Unbraked runout.	• When rotor is stationary, open lid using emergency unlocking (see Emergency Unlocking chapter). • Allow motor to cool down.
Version error	No display in speed field; figure in time field.	Incorrect machine version set, control unit jumps into Setting menu.	• Set the figure 4 in the time field with the ▲ or ▼ arrow keys and confirm with STOP • Perform mains reset.
Controller watchdog	- C -	Fault in control unit Unbraked runout.	• Perform mains reset when stationary.
Lid error	- d -	Unbraked rundown, after standstill lid release	• Perform mains reset after standstill.
Short circuit	- E -	Short circuit in control unit / power unit.	• Perform mains reset when stationary.
No rotor code	- F -	No rotor recognition at start. No rotor fitted or defective tacho.	• Perform mains reset when stationary.
New rotor identified	rot ...	see section rotor identification	• Press START key.

21 Repairs

Repairs must only be carried out by personnel authorised to do so by the manufacturer.

22 Customer Services / Servicing

Should your centrifuge break down or develop a fault, it should not be touched by anyone except an engineer authorised by the manufacturers.

In such a case you should contact Hettich Customer Services.

Before contacting our Customer Services department you should make a note of the following:

1. Centrifuge model
2. The factory number

Both of these numbers can be found on the centrifuge's model plate.

Note down any problems experienced.

You must follow the steps above in order to return to normal operation as quickly as possible.

23 Acceptance of the centrifuges for repair

If the centrifuge is returned to the manufacturer for repair, it must be decontaminated and cleaned to protect persons, environment and material.

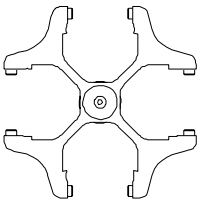
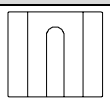
We reserve the right to accept contaminated centrifuges.

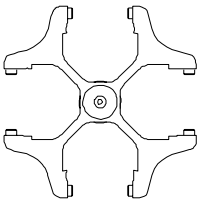
Costs incurred for cleaning and disinfection are to be charged to the customer.

We ask for your understanding in this matter.

You will find further information on our homepage: http://www.HettichLab.com

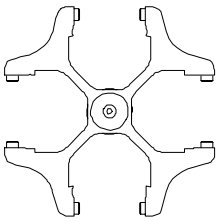
24 Rotors and accessories

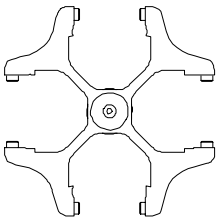
Order no. 1624		1308	1345	1346	1366				
Swing-out rotor 4-times 									
		Reduction							
					1326	1327	1357	5277	
		Tubes							
							Rhesus Glass	Reaction tubes	
Capacity	ml	50	45	20	4	3	1	1,5	2,0
Dimensions ∅ x L	mm	34 x 100	31 x 100	21 x 100	12 x 60	10 x 60	6 x 45	11 x 38	11 x 38
Number per Frame		1	1	2	12	12	30	9	9
Number per Rotor		4	4	8	48	48	120	36	36
Speed	RPM	4000	4000	4000	4000	4000	4000	4000	4000
RCF		2325	2451	2361	1932	1932	1950	1968	1968
Radius	mm	130	137	132	108	108	109	110	110
Run-up time (97%)	sec	22	22	22	22	22	22	22	22
Run-down time	sec	25	25	25	25	25	25	25	25
	sec	110	110	110	110	110	110	110	110
Temperature	°C [1]								

Order no. 1624		1369	1369-91	1369-92	1370	1372			
Swing-out rotor 4-times 									
		Reduction							
		Tubes							
Capacity	ml	15	5	7	9	5			
Dimensions ∅ x L	mm	17 x 100	12 x 75	12 x 100	14 x 100	12 x 75			
Number per Frame		4	4	4	5	17			
Number per Rotor		16	16	16	20	68			
Speed	RPM	4000	4000	4000	4000	4000			
RCF		2361	2236	2361	2361	2164			
Radius	mm	132	125	132	132	121			
Run-up time (97%)	sec	22	22	22	22	22			
Run-down time	sec	25	25	25	25	25			
	sec	110	110	110	110	110			
Temperature	°C [1]								

normal braking effect (1)
low braking effect (0)

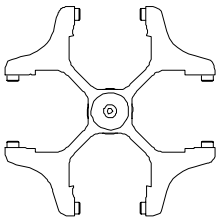
1) The lowest possible temperature during the highest revolutions and 1 hour running time (only in a cooled centrifuge)

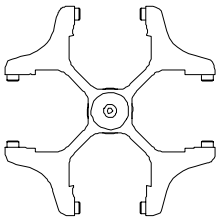
Order no. 1624		1382			1381				
Swing-out rotor 4-times 									
		Reduction							
		1329			1330	1331	1339	1343	1347
		Tubes							
				Sarstedt					Falcon
Capacity	ml	9	15	9-10	25	50	1	3	15
Dimensions ∅ x L	mm	14 x 100	17 x 100	16,5 x 92	24 x 100	34 x 100	6 x 45	10 x 60	17 x 120
Number per Frame		4	4	4	1	1	27	9	1
Number per Rotor		16	16	16	4	4	108	36	4
Speed	RPM	4000	4000	4000	4000	4000	4000	4000	4000
RCF		2540	2540	2540	2433	2397	2594	2630	2665
Radius	mm	142	142	142	136	134	145	147	149
Run-up time (97%)	sec	22	22	22	22	22	22	22	22
Run-down time	sec	25	25	25	25	25	25	25	25
	sec	110	110	110	110	110	110	110	110
Temperature	°C [1]								

Order no. 1624		1382				1381		
Swing-out rotor 4-times 								
		Reduction						
		1348				1351		
		Tubes						
			Sarstedt	Vacutainer		Reaction tubes		
Capacity	ml	10	4,0 – 5,5	7	9,5 - 10	8,5 –10	1,5	2,0
Dimensions ∅ x L	mm	16 x 80	15,3 x 75	16 x 75	16 x 100	16 x 100	11 x 38	11 x 38
Number per Frame		4	4	4	4	4	5	5
Number per Rotor		16	16	16	16	16	20	20
Speed	RPM	4000	4000	4000	4000	4000	4000	4000
RCF		2522	2522	2522	2522	2522	2451	2451
Radius	mm	141	141	141	141	141	137	137
Run-up time (97%)	sec	22	22	22	22	22	22	22
Run-down time	sec	25	25	25	25	25	25	25
	sec	110	110	110	110	110	110	110
Temperature	°C [1]							

normal braking effect (1)
low braking effect (0)

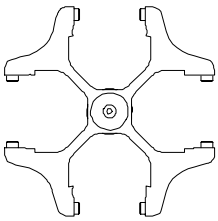
1) The lowest possible temperature during the highest revolutions and 1 hour running time t (only in a cooled centrifuge)

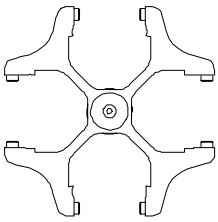
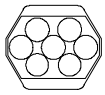
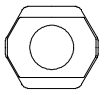
Order no. 1624		1382	1381						
Swing-out rotor 4-times 									
		Reduction							
		1383							
		Tubes							
				Sarstedt				Vacutainer	
Capacity	ml	6	7	4,9	4,5 – 5,0	2,0 – 3,0	2,6 – 2,9	2,0 – 5,0	1,6 – 5,0
Dimensions ∅ x L	mm	12 x 82	12 x 100	13 x 90	11,5 x 92	11,5 x 66	13 x 65	13 x 75	13 x 75
Number per Frame		5	5	5	5	5	5	5	5
Number per Rotor		20	20	20	20	20	20	20	20
Speed	RPM	4000	4000	4000	4000	4000	4000	4000	4000
RCF		2558	2558	2558	2558	2558	2558	2558	2558
Radius	mm	143	143	143	143	143	143	143	143
Run-up time (97%)	sec	22	22	22	22	22	22	22	22
Run-down time	sec	25	25	25	25	25	25	25	25
	sec	110	110	110	110	110	110	110	110
Temperature	°C [1]								

Order no. 1624		1382	1381						
Swing-out rotor 4-times 									
		Reduction							
		1383				1384	1396	1457	
		Tubes							
		Vacutainer				Falcon		Sarstedt	
Capacity	ml	4,5 – 6,0	2,0 – 4,0	4,5 – 7,0	4,0 – 6,0	50	85	1,1 – 1,4	
Dimensions ∅ x L	mm	13 x 100	13 x 75	13 x 100	13 x 100	29 x 115	38 x 106	8,5 x 66	
Number per Frame		5	5	5	5	1	1	7	
Number per Rotor		20	20	20	20	4	4	28	
Speed	RPM	4000	4000	4000	4000	4000	4000	4000	
RCF		2558	2558	2558	2558	2665	2612	2576	
Radius	mm	143	143	143	143	149	146	144	
Run-up time (97%)	sec	22	22	22	22	22	22	22	
Run-down time	sec	25	25	25	25	25	25	25	
	sec	110	110	110	110	110	110	110	
Temperature	°C [1]								

normal braking effect (9)
low braking effect (0)

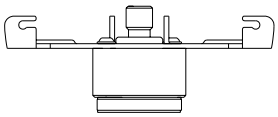
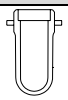
1) The lowest possible temperature during the highest revolutions and 1 hour running time (only in a cooled centrifuge)

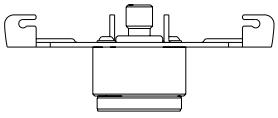
Order no. 1624		1382		1381					
Swing-out rotor 4-times 									
		Reduction							
		1459		4416	4417	0761 Rubber insert	0765 Rubber insert		
		Tubes							
							VK 0534 Chromium-bath tubes Skal. 10µl-300µl, 15ml, 30ml VK 0535 lid (rubber)		
Capacity	ml	4,0 - 5,5	7,5 - 8,2	50	30	100	30		
Dimensions ∅ x L	mm	15,3 x 75	15,3 x 92	29 x 107	26 x 95	44 x 100	44 x 105		
Number per Frame		4	4	1	1	1	1		
Number per Rotor		16	16	4	4	4	4		
Speed	RPM	4000	4000	4000	4000	4000	4000		
RCF		2576	2576	2630	2451	2558	2558		
Radius	mm	144	144	147	137	143	143		
Run-up time (97%)	sec	22	22	22	22	22	22		
Run-down time	sec	25	25	25	25	25	25		
	sec	110	110	110	110	110	110		
Temperature	°C 1)								

Order no. 1624		1741	1742	1745	1746				
Swing-out rotor 4-times 									
		Reduction							
		0701 Rubber Inlay	----	----	----				
		Tubes							
Capacity	ml	9	15	25	50				
Dimensions ∅ x L	mm	14 x 100	17 x 100	24 x 100	34 x 100				
Number per Frame		10	7	2	1				
Number per Rotor		40	28	8	4				
Speed	RPM	4000	4000	4000	4000				
RCF		2415	2451	2451	2451				
Radius	mm	135	137	137	137				
Run-up time (97%)	sec	22	22	22	22				
Run-down time	sec	25	25	25	25				
	sec	110	110	110	110				
Temperature	°C 1)								

normal braking effect (1)
low braking effect (0)

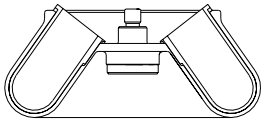
1) The lowest possible temperature during the highest revolutions and 1 hour running time (only in a cooled centrifuge)

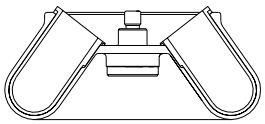
Order no. 1611		1131					1132		
Angle -rotor 8-times (90°) 									
		Reduction							
		Tubes							
			Sarstedt	Vacutainer				Sarstedt	
Capacity	ml	5	2,6 – 2,9	2,0 – 4,0	1,6 – 5,0	2,0 – 5,0	10	4,0 – 5,5	
Dimensions ∅ x L	mm	12 x 75	13 x 65	13 x 75	13 x 75	13 x 75	17 x 70	15,3 x 75	
Number per Frame		1	1	1	1	1	1	1	
Number per Rotor		8	8	8	8	8	8	8	
Speed	RPM	4000	4000	4000	4000	4000	4000	4000	
RCF		1914	1914	1914	1914	1914	1914	1914	
Radius	mm	107	107	107	107	107	107	107	
Run-up time (97%)	sec	22	22	22	22	22	22	22	
Run-down time	sec	25	25	25	25	25	25	25	
	sec	104	104	104	104	104	104	104	
Temperature	°C [1]								

Order no. 1611		1643				1644			
Angle -rotor 8-times (90°) 									
		Reduction							
		Tubes							
			Vacutainer						
Capacity	ml	7	4,0 – 6,0	4,5 – 7,0	4,5 – 6,0	15			
Dimensions ∅ x L	mm	12 x 100	13 x 100	13 x 100	13 x 100	17 x 100			
Number per Frame		1	1	1	1	1			
Number per Rotor		8	8	8	8	8			
Speed	RPM	4000	4000	4000	4000	4000			
RCF		2415	2415	2415	2415	2415			
Radius	mm	135	135	135	135	135			
Run-up time (97%)	sec	22	22	22	22	22			
Run-down time	sec	25	25	25	25	25			
	sec	104	104	104	104	104			
Temperature	°C [1]								

normal braking effect (1)
low braking effect (0)

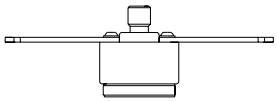
1) The lowest possible temperature during the highest revolutions and 1 hour running time (only in a cooled centrifuge)

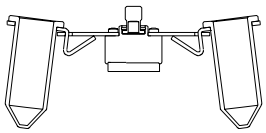
Order no. 1620A									
Angle -rotor 6-times (35°) 									
					Reduction				
		1449		1448	1451		1447	1446	1463
					Tubes				
		Reaction tubes				Sarstedt			
Capacity	ml	1,5	2,0	10	15	9-10	30	50	50
Dimensions ∅ x L	mm	11 x 38	11 x 38	16 x 80	17 x 100	16,5 x 92	26 x 95	29 x 107	35 x 105
Number per Frame		4	4	2	1	1	1	1	1
Number per Rotor		24	24	12	6	6	6	6	6
Speed	RPM	6000	6000	6000	6000	6000	6000	6000	6000
RCF		4065	4065	3904	3904	3904	3824	4025	4146
Radius	mm	101	101	97	97	97	95	100	103
Run-up time (97%)	sec	19	19	19	19	19	19	19	19
Run-down time	sec	22	22	22	22	22	22	22	22
	sec	104	104	104	104	104	104	104	104
Temperature	°C [1]								

Order no. 1620A				1646					
Angle -rotor 6-times (35°) 				Falcon-Set (for 6 tubes)					
					Reduction				
		----	1464	----					
					Tubes				
			Falcon						
Capacity	ml	85	15	50					
Dimensions ∅ x L	mm	38 x 106	17 x 120	29 x 115					
Number per Frame		----	1	1					
Number per Rotor		6	6	3					
Speed	RPM	6000	6000	6000					
RCF		4186	3985	3985					
Radius	mm	104	104	104					
Run-up time (97%)	sec	19	19	19					
Run-down time	sec	22	22	22					
	Sec	104	104	104					
Temperature	°C [1]								

normal braking effect (1)
low braking effect (0)

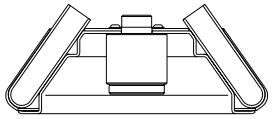
1) The lowest possible temperature during the highest revolutions and 1 hour running time (only in a cooled centrifuge)

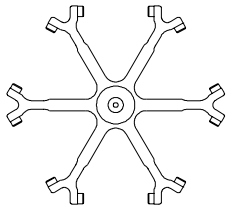
Order no. 1628		1127 (50°)				1122 (55°)	1621 (75°)		
12-times (50°-75°) 									
		Reduction							
		Tubes							
Capacity	ml	5	2,0 – 5,0	1,6 – 5,0	2,0 – 4,0	10	15		
Dimensions ∅ x L	mm	12 x 75	13 x 75	13 x 75	13 x 75	17 x 70	17 x 100		
Number per Frame		1	1	1	1	1	1		
Number per Rotor		12	12	12	12	12	12		
Speed	RPM	4000	4000	4000	4000	4000	4000		
RCF		2218	2218	2218	2218	2254	2683		
Radius	mm	124	124	124	124	126	150		
Run-up time (97%)	sec	22	22	22	22	22	22		
Run-down time	sec	25	25	25	25	25	25		
	sec	110	110	110	110	110	110		
Temperature	°C [1]								

Order no. 1617				Order no. 1619			
Swing-out rotor 8-times (45°) 				Swing-out rotor 6-times (90°)			
		Reduction			Reduction		
		1462			1462		
		Tubes			Tubes		
		Falcon			Falcon		
Capacity	ml	15	50		15	15	
Dimensions ∅ x L	mm	17 x 120	29 x 115		17 x 120	29 x 115	
Number per Frame		1	1		1	1	
Number per Rotor		8	8		6	6	
Speed	RPM	4000	4000		4000	4000	
RCF		2469	2469		2701	2701	
Radius	mm	138	138		151	151	
Run-up time (97%)	sec	22	22		22	22	
Run-down time	sec	25	25		25	25	
	sec	110	110		110	110	
Temperature	°C [1]						

normal braking effect (1)
low braking effect (0)

1) The lowest possible temperature during the highest revolutions and 1 hour running time (only in a cooled centrifuge)

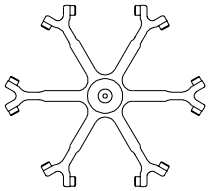
Order no. 1613									
Angle -rotor r 12-times (35°) 									
		Reduction							
		1056	---	---					
		Tubes							
				Falcon					
Capacity	ml	5	15	15					
Dimensions ∅ x L	mm	12 x 75	17 x 100	17 x 120					
Number per Frame									
Number per Rotor		12	12	6					
Speed	RPM	6000	6000	6000					
RCF		3461	4105	4105					
Radius	mm	86	102	102					
Run-up time (97%)	sec	13	13	13					
Run-down time	sec	15	15	15					
	sec	104	104	104					
Temperature	°C [1]								

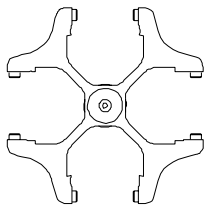
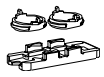
Order no. 1626		1661 + 1660							
Swing-out rotor 6-times 									
		1662						**1670**	
		1663	**1664**	**1665**	**1666**	**1667**	**1668**	**1663**	**1664**
Filter Cards		1675	1675	1675	1676	1677	1678	1692	1692
Capacity	ml	1	2	4	8	3 x 2	4 x 1	1	2
Dimensions ∅ / A	mm^2	6,2 x 30	8,7 x 60	12,4 x 120	17,5 x 240	8,7 x 60	6,2 x 30	6,2 x 30	8,7 x 60
Number per Frame		1	1	1	1	1	1	2	2
Number per Rotor		6	6	6	6	6	6	12	12
Speed	RPM	4000	4000	4000	4000	4000	4000	4000	4000
RCF		2039	2039	2039	2039	2039	2039	2039	2039
Radius	mm	114	114	114	114	114	114	114	114
Run-up time (97%)	sec	22	22	22	22	22	22	22	22
Run-down time	sec	25	25	25	25	25	25	25	25
	sec	110	110	110	110	110	110	110	110
Temperature	°C [1]								

normal braking effect (1)
low braking effect (0)

1) The lowest possible temperature during the highest revolutions and 1 hour running time (only in a cooled centrifuge)

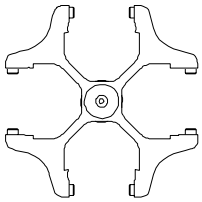
2) Object carrier will not stand RCF values exceeding 1100

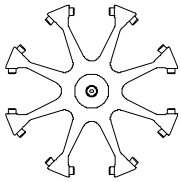
Order no. 1626	1661 + 1660				1660	1680		
Swing-out rotor 6-times 								
	1670				1285 only without lid 1661	1662		
	1665	1666	1667	1668		1671	1672	1673
Filter Cards	1692	1691	1694	1693		[1] 1696 [2] 1676	[1] 1697 [2] 1676	[1] 1698 [2] 1676
Capacity ml	4	8	3 x 2	4 x 1	Object slide	[1] 0,3 [2] 1,5	[1] 0,3 [2] 1,25	[1] 0,3 [2] 0,75
Dimensions ∅ / A mm^2	12,4 x 120	17,5 x 240	8,7 x 60	6,2 x 30	26 x 76	6,2 / 30	8,7 / 60	12,4 / 120
Number per Frame	2	2	2	2	6	1	1	1
Number per Rotor	12	12	12	12	36	6	6	6
Speed RPM	4000	4000	4000	4000	4000	4000	4000	4000
RCF	2039	2039	2039	2039		1842	1842	1842
Radius mm	114	114	114	114		103	103	103
Run-up time (97%) sec	22	22	22	22		22	22	22
Run-down time ◧◨ sec	25	25	25	25		25	25	25
◨◧ sec	110	110	110	110		110	110	110
Temperature °C [1]								

Order no. 1624	1661 + 1660							
Swing-out rotor 4-times 								
	1662						1670	
							 2)	
	1663	1664	1665	1666	1667	1668	1663	1664
Filter Cards	1675	1675	1675	1676	1677	1678	1692	1692
Capacity ml	1	2	4	8	3 x 2	4 x 1	1	2
Dimensions ∅ / A mm^2	6,2 x 30	8,7 x 60	12,4 x 120	17,5 x 240	8,7 x 60	6,2 x 30	6,2 x 30	8,7 x 60
Number per Frame	1	1	1	1	1	1	2	2
Number per Rotor	4	4	4	4	4	4	8	8
Speed RPM	4000	4000	4000	4000	4000	4000	4000	4000
RCF	1646	1646	1646	1646	1646	1646	1646	1646
Radius mm	92	92	92	92	92	92	92	92
Run-up time (97%) sec	22	22	22	22	22	22	22	22
Run-down time ◧◨ sec	25	25	25	25	25	25	25	25
◨◧ sec	110	110	110	110	110	110	110	110
Temperature °C [1]								

◧◨ normal braking effect (1)
◨◧ low braking effect (0)
[1] One-step-methode [2] Two-step-methode

1) The lowest possible temperature during the highest revolutions and 1 hour running time (only in a cooled centrifuge)
2) Object carrier will not stand RCF values exceeding 1100

Order no. 1624	1661 + 1660				1660	1680		
Swing-out rotor 4-times 								
	1670				1285	1662		
					only without lid 1661			
	1665	1666	1667	1668		1671	1672	1673
Filter Cards	1692	1691	1694	1693		[1] 1696 [2] 1676	[1] 1697 [2] 1676	[1] 1698 [2] 1676
Capacity ml	4	8	3 x 2	4 x 1	Object slide	[1] 0,3 [2] 1,5	[1] 0,3 [2] 1,25	[1] 0,3 [2] 0,75
Dimensions ∅ / A mm^2	12,4 x 120	17,5 x 240	8,7 x 60	6,2 x 30	26 x 76	6,2 / 30	8,7 / 60	12,4 / 120
Number per Frame	2	2	2	2	6	1	1	1
Number per Rotor	8	8	8	8	24	4	4	4
Speed RPM	4000	4000	4000	4000	4000	4000	4000	4000
RCF	1646	1646	1646	1646		1449	1449	1449
Radius mm	92	92	92	92		81	81	81
Run-up time (97%) sec	22	22	22	22		22	22	22
Run-down time ◐ sec	25	25	25	25		25	25	25
Run-down time ◯ sec	110	110	110	110		110	110	110
Temperature °C [1]								

Order no. 1648	1680							
Swing-out rotor 8-times 								
	1662							
	1671	1672	1673					
Filter Cards	[1] 1696 [2] 1676	[1] 1697 [2] 1676	[1] 1698 [2] 1676					
Capacity ml	[1] 0,3 [2] 1,5	[1] 0,3 [2] 1,25	[1] 0,3 [2] 0,75					
Dimensions ∅ / A mm^2	6,2 / 30	8,7 / 60	12,4 / 120					
Number per Frame	1	1	1					
Number per Rotor	8	8	8					
Speed RPM	4000	4000	4000					
RCF	2218	2218	2218					
Radius mm	124	124	124					
Run-up time (97%) sec	22	22	22					
Run-down time ◐ sec	28	28	28					
Run-down time ◯ sec	117	117	117					
Temperature °C [1]								

◐ normal braking effect (1)
◯ low braking effect (0)
[1] One-step-methode [2] Two-step-methode

1) The lowest possible temperature during the highest revolutions and 1 hour running time (only in a cooled centrifuge)
2) Object carrier will not stand RCF values exceeding 1100

Subject to alteration !